NO_X MEASUREMENTS

§ 1065.270 Chemiluminescent detector.

(a) *Application.* You may use a chemiluminescent detector (CLD) to measure NO_X concentration in raw or diluted exhaust for batch or continuous sampling. We generally accept a CLD for NO_X measurement, even though it measures only NO and NO_2, when coupled with an NO_2-to-NO converter, since conventional engines and aftertreatment systems do not emit significant amounts of NO_X species other than NO and NO_2. Measure other NO_X species if required by the standard-setting part. While you may also use other instruments to measure NO_X, as described in §1065.272, use a reference procedure based on a chemiluminescent detector for comparison with any proposed alternate measurement procedure under §1065.10.

(b) *Component requirements.* We recommend that you use a CLD that meets the specifications in Table 1 of §1065.205. Note that your CLD-based system must meet the quench verification in §1065.370 and it must also meet the linearity verification in §1065.307. You may use a heated or unheated CLD, and you may use a CLD that operates at atmospheric pressure or under a vacuum. You may use a CLD that has compensation algorithms that are functions of other gaseous measurements and the engine's known or assumed fuel properties. The target value for any compensation algorithm is 0.0% (that is, no bias high and no bias low), regardless of the uncompensated signal's bias.

(c) *NO_2-to-NO converter.* Place upstream of the CLD an internal or external NO_2-to-NO converter that meets the verification in §1065.378. Configure the converter with a bypass to facilitate this verification.

(d) *Humidity effects.* You must maintain all CLD temperatures to prevent aqueous condensation. To remove humidity from a sample upstream of a CLD, use one of the following configurations:

(1) Connect a CLD downstream of any dryer or chiller that is downstream of an NO_2-to-NO converter that meets the verification in §1065.378.

(2) Connect a CLD downstream of any dryer or thermal chiller that meets the verification in §1065.376.

(e) *Response time.* You may use a heated CLD to improve CLD response time.

EFFECTIVE DATE NOTE: At 73 FR 37300, June 30, 2008, §1065.270 was amended by revising paragraphs (c) and (d) introductory text, effective July 7, 2008. For the convenience of the user, the revised text is set forth as follows:

§ 1065.270 Chemiluminescent detector.

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(c) *NO_2-to-NO converter.* Place upstream of the CLD an internal or external NO_2-to-NO converter that meets the verification in §1065.378. Configure the converter with a bypass line if it is needed to facilitate this verification.

(d) *Humidity effects.* You must maintain all CLD temperatures to prevent aqueous condensation. If you remove humidity from a sample upstream of a CLD, use one of the following configurations:

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§ 1065.272 Nondispersive ultraviolet analyzer.

(a) *Application.* You may use a nondispersive ultraviolet (NDUV) analyzer to measure NO_X concentration in raw or diluted exhaust for batch or continuous sampling. We generally accept an NDUV for NO_X measurement, even though it measures only NO and NO_2, since conventional engines and aftertreatment systems do not emit significant amounts of other NO_X species. Measure other NO_X species if required by the standard-setting part.

(b) *Component requirements.* We recommend that you use an NDUV analyzer that meets the specifications in Table 1 of §1065.205. Note that your NDUV-based system must meet the verifications in §1065.372 and it must also meet the linearity verification in §1065.307. You may use a NDUV analyzer that has compensation algorithms that are functions of other gaseous measurements and the engine's known or assumed fuel properties. The target value for any compensation algorithm is 0.0% (that is, no bias high and no bias low), regardless of the uncompensated signal's bias.

(c) *NO_2-to-NO converter.* If your NDUV analyzer measures only NO, place upstream of the NDUV analyzer an internal or external NO_2-to-NO converter that meets the verification in § 1065.378. Configure the converter with a bypass to facilitate this verification.

(d) *Humidity effects.* You must maintain NDUV temperature to prevent aqueous condensation, unless you use one of the following configurations:

(1) Connect an NDUV downstream of any dryer or chiller that is downstream of an NO_2-to-NO converter that meets the verification in § 1065.378.

(2) Connect an NDUV downstream of any dryer or thermal chiller that meets the verification in § 1065.376.

O_2 Measurements

§ 1065.280 Paramagnetic and magnetopneumatic O_2 detection analyzers.

(a) *Application.* You may use a paramagnetic detection (PMD) or magnetopneumatic detection MPD) analyzer to measure O_2 concentration in raw or diluted exhaust for batch or continuous sampling. You may use O_2 measurements with intake air or fuel flow measurements to calculate exhaust flow rate according to § 1065.650.

(b) *Component requirements.* We recommend that you use a PMD/MPD analyzer that meets the specifications in Table 1 of § 1065.205. Note that it must meet the linearity verification in § 1065.307. You may use a PMD/MPD that has compensation algorithms that are functions of other gaseous measurements and the engine's known or assumed fuel properties. The target value for any compensation algorithm is 0.0% (that is, no bias high and no bias low), regardless of the uncompensated signal's bias.

EFFECTIVE DATE NOTE: At 73 FR 37300, June 30, 2008, § 1065.280 was revised, effective July 7, 2008 For the convenience of the user, the revised text is set forth as follows:

§ 1065.280 Paramagnetic and magnetopneumatic O_2 detection analyzers.

(a) *Application.* You may use a paramagnetic detection (PMD) or magnetopneumatic detection (MPD) analyzer to measure O_2 concentration in raw or diluted exhaust for batch or continuous sampling. You may use O_2 measurements with intake air or fuel flow measurements to calculate exhaust flow rate according to § 1065.650.

(b) *Component requirements.* We recommend that you use a PMD or MPD analyzer that meets the specifications in Table 1 of § 1065.205. Note that it must meet the linearity verification in § 1065.307. You may use a PMD or MPD that has compensation algorithms that are functions of other gaseous measurements and the engine's known or assumed fuel properties. The target value for any compensation algorithm is 0.0% (that is, no bias high and no bias low), regardless of the uncompensated signal's bias.

Air-to-Fuel Ratio Measurements

§ 1065.284 Zirconia (ZrO_2) analyzer.

(a) *Application.* You may use a zirconia (ZrO_2) analyzer to measure air-to-fuel ratio in raw exhaust for continuous sampling. You may use O_2 measurements with intake air or fuel flow measurements to calculate exhaust flow rate according to § 1065.650.

(b) *Component requirements.* We recommend that you use a ZrO_2 analyzer that meets the specifications in Table 1 of § 1065.205. Note that your ZrO_2-based system must meet the linearity verification in § 1065.307. You may use a Zirconia analyzer that has compensation algorithms that are functions of other gaseous measurements and the engine's known or assumed fuel properties. The target value for any compensation algorithm is 0.0% (that is, no bias high and no bias low), regardless of the uncompensated signal's bias.

PM Measurements

§ 1065.290 PM gravimetric balance.

(a) *Application.* Use a balance to weigh net PM on a sample medium for laboratory testing.

(b) *Component requirements.* We recommend that you use a balance that meets the specifications in Table 1 of § 1065.205. Note that your balance-based system must meet the linearity verification in § 1065.307. If the balance uses internal calibration weights for routine spanning and linearity verifications, the calibration weights must meet the specifications in § 1065.790. While you may also use an inertial balance to measure PM, as described in § 1065.295, use a reference procedure based on a gravimetric balance